Tests
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Math 31
1969

DEPARTMENT
EDUCATION ALBERTA

HIGH SCHOOL AND UNIVERSITY MATRICULATION EXAMINATIONS BOARD

DEPARTMENTAL EXAMINATIONS, 1969

MATHEMATICS 31 (New)

Time — 2 hours.

Total Possible Mark — Sections A and B, 49; Sections A and C, 54.

Note — DO NOT SPEND TOO MUCH TIME ON ANY ONE QUESTION. READ THE QUESTIONS CAREFULLY.

This examination consists of THREE sections:

SECTION A is to be attempted by ALL STUDENTS.
SECTION B is to be attempted only by those students using the textbook, *CALCULUS*.
SECTION C is to be attempted only by those students using the textbook, *VECTORS AND MATRICES*.

Knott's Mathematical Tables will be provided.
Slide rules are NOT PERMITTED.
Record answers on the answer sheet provided using an ORDINARY HB pencil.

To ensure accuracy in the handling of your examination papers, the following sections on your answer sheet MUST BE COMPLETED.

SECTION A — Supply information as requested.

SECTION B — *Step (1)* *Carefully check label.* Notify the presiding examiner if the name on the label does not correspond to your name.

Step (2) Place label into the dotted box.

Step (3) Indicate your name, mailing address and birth date whether or not you have a label.

SECTION C — Supply information as requested.

SECTION D — *Step (1)* From the label, write your student number into the column of blank boxes in Section D. Begin by placing the left-most digit into the top box.

Step (2) For the digit you have placed into each box, blacken the appropriate guide line containing this digit.

IF NO LABEL HAS BEEN PROVIDED, omit Section D.

DO NOT FOLD EITHER THE ANSWER SHEET OR THE TEST BOOKLET.

Your Presiding Examiner will collect the answer sheet and booklet separately for transmission to the Department.

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All questions will be machine-scored. Each question has four suggested answers, one of which is correct. Select the correct answer and record it on the separate ANSWER SHEET as shown in the example below.

EXAMPLE:

The exact value of tan 45° is

A. 0
B. 1
C. $\sqrt{3}$
D. 0.7

ANSWER SHEET

A	B	C	D	E
☐	■	☐	☐	☐

DISREGARD COLUMN "E"
ON ANSWER SHEET

Mark your answer sheet using an ORDINARY HB PENCIL. Make sure your marks are heavy and clear. If you change your mind about an answer, be sure to erase your first mark completely. MARK ONLY ONE CHOICE FOR EACH QUESTION. Do not bend or fold the answer sheet.

Rough work is to be done in this booklet. Space is provided. No marks are to appear on the separate answer sheet except those indicating the answers chosen.

Your score on this test will be determined by the number of correct answers. There will be no deduction for wrong answers.

SECTION A

QUESTIONS 1 - 28 ARE TO BE DONE BY ALL STUDENTS.

1. As a function of θ, $\csc(2\pi - \theta)$ is equal to

A. $-\csc\theta$

B. $\csc\theta$

C. $2\csc\theta$

D. $-2\pi\csc\theta$

2. The value of $\dfrac{\csc 30^\circ}{\sec 45^\circ}$ is

A. $\dfrac{2\sqrt{3}}{3}$

B. $\sqrt{2}$

C. $\dfrac{\sqrt{6}}{3}$

D. $\sqrt{6}$

3. Expressed in radians 200° is equivalent to

A. $\dfrac{10\pi}{9}$

B. $\dfrac{200}{\pi}$

C. $\dfrac{10}{9}$

D. $\dfrac{(200)(180)}{\pi}$

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FOR COMPUTATIONS AND ROUGH WORK

(No marks will be assigned for work in this booklet.)

[OVER]

4. If a pulley revolves at 30 revolutions per minute, its angular velocity in radians per minute is

A. $\frac{15}{\pi}$
B. 60
C. 60π
D. 15

5. $\frac{1}{1 - \sec^2 x}$ is equivalent to

A. $-\operatorname{ctn} x$
B. $-\cos^2 x$
C. $-\operatorname{ctn}^2 x$
D. $-\tan^2 x$

6. The exact value of ctn 330° is

A. $-\sqrt{3}$
B. $-\frac{\sqrt{3}}{3}$
C. $\sqrt{3}$
D. $\frac{1}{\sqrt{3}}$

7. The value of Arc $\csc(-\sqrt{2})$ is

A. 315°
B. –135°
C. –45°
D. 225°

8. The period of $\sin \frac{2\theta}{3}$ is

A. 240°
B. 540°
C. 120°
D. 270°

9. The exact value of $\cos^2(-30^\circ) - \sin^2(-30^\circ)$ is

A. –1
B. –½
C. ½
D. 1

10. If $\cos \theta = -\frac{8}{9}$ and θ is not in the 2nd quadrant, then the value of $\tan \theta$ is

A. $-\frac{8\sqrt{17}}{17}$
B. $\frac{\sqrt{17}}{8}$
C. $\frac{8\sqrt{17}}{17}$
D. $-\frac{\sqrt{17}}{8}$

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FOR COMPUTATIONS AND ROUGH WORK

(No marks will be assigned for work in this booklet.)

11. If $a = 2 \sec C$ and $b = 2 \tan C$, then the value of $(a - b)(a + b)$ is

A. 2
B. -2
C. -4
D. 4

12. If the inclination of a roof of a building is 30°, then the pitch of the roof is

A. $\frac{1}{2}$
B. $\frac{\sqrt{3}}{3}$
C. $\frac{1}{4}$
D. $\frac{\sqrt{3}}{6}$

13. The value of $\sin \left[\text{Arc} \cos \left(-\frac{\sqrt{2}}{2} \right) \right]$ is

A. $-\frac{\sqrt{2}}{2}$
B. $\frac{\sqrt{2}}{2}$
C. $\sqrt{2}$
D. $\frac{1}{2}$

14. An equivalent expression for $\sin(\pi - \theta) \cos(2\pi - \theta) + \sin\left(\frac{\pi}{2} - \theta\right) \cos\left(\frac{\pi}{2} - \theta\right)$ is

A. $-\sin \theta \cos \theta$
B. $\sin 2\theta$
C. $\sin \theta \cos \theta$
D. $\cos 2\theta$

15. $\dfrac{\cos^3 A}{\sin A - \sin^3 A}$ is equivalent to

A. $\csc A - \text{ctn}^3 A$
B. $\tan A$
C. $\cos^3 A \csc A - \text{ctn}^3 A$
D. $\text{ctn}\, A$

16. The area in square units of the region bounded by a rhombus with sides 5 units and one angle of 150° is

A. $\frac{25\sqrt{3}}{2}$
B. 12.5
C. 6.25
D. 25

17. A triangle MNO has $N = 30°$ and $m = 12$ units. If there are two solutions for the triangle, the range of values of n may be

A. $12 > n \geqq 6$
B. $12 \geqq n \geqq 6$
C. $12 > n > 6$
D. $12 \geqq n > 6$

FOR COMPUTATIONS AND ROUGH WORK

(No marks will be assigned for work in this booklet.)

18. The value of $\sin^2 \theta - \cos^2 \theta$, when $\tan \theta = -\frac{4}{3}$ and $\csc \theta$ is negative, is

A. $\frac{7}{25}$

B. 1

C. $-\frac{7}{25}$

D. $-\frac{9}{16}$

19. In terms of $\tan A$, $\tan(45° - A)$, equals

A. $\dfrac{1 - \sqrt{2} \tan A}{1 + \sqrt{2} \tan A}$

B. $1 - \tan A$

C. $\dfrac{1 + \tan A}{1 - \tan A}$

D. $\dfrac{1 - \tan A}{1 + \tan A}$

20. What is the linear velocity in feet per second of a point on the rim of a wheel 40 inches in diameter if the wheel turns at 10 revolutions per second?

A. 80π

B. 400π

C. $\frac{100\pi}{3}$

D. 80

21. The solutions for the equation $4 \sin A \cos A - 1 = 0$, $0° \leqq A < 180°$, are

A. 30°, 150°

B. 15°, 30°, 75°, 150°, 165°

C. 15°, 75°

D. 15°, 75°, 165°

22. The expression $\dfrac{\sin(2x - 5y) + \sin 5y}{\cos(2x - 5y) + \cos 5y}$ is equivalent to

A. $\tan(2x - 5y) + \tan 5y$

B. $2 \tan x$

C. $\tan 2x$

D. $\tan x$

23. An equivalent expression for $\dfrac{\cos x + \sin x}{\cos x - \sin x}$ is

A. 0

B. $1 + \sin 2x$

C. $\tan 2x + \sec 2x$

D. $\cos 2x + \sin 2x \cos 2x$

FOR COMPUTATIONS AND ROUGH WORK

(No marks will be assigned for work in this booklet.)

24. If the measure of the radius of a circle is 20 ft., then the length of a chord in inches subtended by a central angle of $\frac{\pi}{6}$ is

A. 10.35
B. 38.74
C. 5.176
D. 20

25. The number of solutions for the equation $2 \cos 4A - 1 = 0$, $0° < A < 180°$, is

A. 3
B. 1
C. 4
D. 2

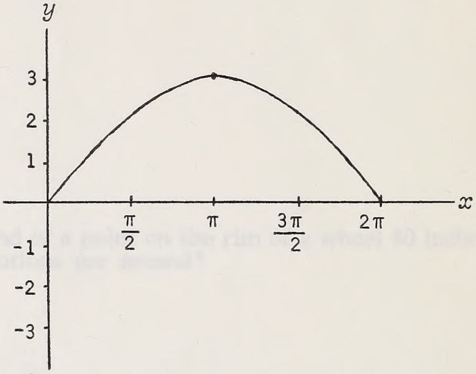
26. The given curve represents a partial graph of the function

A. $3 \cos \frac{x}{2}$

B. $3 \sin \frac{x}{2}$

C. $3 \cos 2x$

D. $3 \sin 2x$



27. Assume the surface of the earth to be a sphere of diameter 7912 miles. The measure of a degree of longitude, in miles, on the sixtieth parallel is

A. $\frac{989}{90} \pi$

B. $\frac{989}{45} \sqrt{3}\, \pi$

C. $\frac{989}{90} \sqrt{3}\, \pi$

D. $\frac{989}{45} \pi$

28. A tower 125 ft. high is on a cliff on the bank of a river. From the top of the tower the angle of depression of a point on the opposite shore is 28° 40′, and from the base of the tower the angle of depression of the same point is 18° 20′. The width of the river in feet is

A. $\frac{125}{(\text{ctn } 18° \ 20' - \text{ctn } 28° \ 40')}$

B. $\frac{125(\sin 61° \ 20' \ \sin 18° \ 20')}{\sin 10° \ 20'}$

C. $\frac{(125 \sin 61° \ 20')}{\sin 10° \ 20'}$

D. $\frac{125}{(\tan 28° \ 40' - \tan 18° \ 20')}$

FOR COMPUTATIONS AND ROUGH WORK

(No marks will be assigned for work in this booklet.)

[OVER]

This concludes SECTION A of the examination paper.

Students using the textbook CALCULUS proceed to SECTION B

Students using the textbook VECTORS AND MATRICES proceed to SECTION C

Students MUST NOT answer both Sections B and C.

SECTION B — pages 14 to 20

You are to attempt ITEMS 29 through 49 only if you have been using the textbook CALCULUS.

If you are attempting this section DO NOT MARK ANY ANSWERS BEYOND ITEM 49.

CALCULUS — SECTION B

29. The second derivative of $y = 3x^3 - \frac{1}{x}$ with respect to x is

A. $18x - \frac{1}{x^3}$
B. $9x^2 + x^{-2}$
C. $18x + \frac{2}{x^3}$
D. $18x - \frac{2}{x^3}$

30. The sum to infinity of $0.01 + 0.001 + 0.0001 + \ldots$ is

A. $0.\dot{1}$
B. 1
C. $\frac{1}{90}$
D. $\frac{1}{900}$

31. The general solution of $D_x y = (3 - x)^2$ is

A. $-6 + 2x + c$
B. $2(3 - x) + c$
C. $9x - 3x^2 + \frac{1}{3}x^3$
D. $-\frac{1}{3}(3 - x)^3 + c$

32. Which statement is NOT true?

The points on a graph where the derivative does NOT exist indicate

A. where the slope of the graph is parallel to the x-axis
B. where the graph has a cusp
C. where the graph crosses itself
D. where the graph has a discontinuity

33. A local minimum value of the function $y = \frac{1}{3}x^3 - \frac{1}{2}x^2 - 6x + 7$ is

A. $-\frac{13}{2}$
B. 3
C. -2
D. $\frac{43}{3}$

34. A particle is moving so that at time t sec., the distance s ft. is given by $s = t^3 - 2t + 1$. The acceleration equals 0 ft./sec.^{2} when t equals

A. $\frac{\sqrt{6}}{3}$
B. 3
C. 1
D. 0

FOR COMPUTATIONS AND ROUGH WORK

(No marks will be assigned for work in this booklet.)

35. $\lim\limits_{x \to a} \dfrac{x^2 - a^2}{x^3 - a^3}$ is

A. $\dfrac{2a}{3}$

B. $\dfrac{2}{3a}$

C. 0

D. There is no limit

36. The graph of $y = x^3 + 3x^2 - 4$ touches the x-axis at the point

A. $(2, 0)$
B. $(-2, 0)$
C. $(1, 0)$
D. The graph does not touch the x-axis

37. If the velocity v ft./sec. at any time t sec. of a particle moving on a line is given by $v = t^2 - 10t - \dfrac{12}{t}$, $t > 0$, the acceleration a ft./sec.^{2} at any time is given by a equals

A. $2 - \dfrac{24}{t^3}$

B. $\dfrac{t^3}{3} - 5t^2 - 12$

C. $2t - 10 + \dfrac{12}{t^2}$

D. $2t - 10 - \dfrac{12}{t^2}$

38. The slope of the secant of the graph of $y = 3x^2$ through the two distinct points where $x = x_1$ and $x = x_2$ is

A. $6(x_1 + x_2)$
B. $6x$
C. $3(x_2 - x_1)$
D. $3(x_2 + x_1)$

39. The derivative of $\dfrac{t^3 + 1}{1 + 2t}$ with respect to t is

A. $\dfrac{3t^2}{2}$

B. $\dfrac{-2(t^3 + 1) + 3t^2(1 + 2t)}{(1 + 2t)^2}$

C. $2(t^3 + 1) + 3t^2(1 + 2t)$

D. $\dfrac{-(t^3 + 1) + 3t^2(1 + 2t)}{(1 + 2t)^2}$

FOR COMPUTATIONS AND ROUGH WORK

(No marks will be assigned for work in this booklet.)

40. A sphere is increasing so that its radius increases at the rate of 1 in./sec. How fast is its volume changing when its radius is 3 in.? The volume of a sphere is given by $\frac{4\pi r^3}{3}$.

A. 12π in.^{3}/sec.
B. 36π in.^{3}/sec.
C. 18π in.^{3}/sec.
D. 108π in.^{3}/sec.

41. The top and bottom margins of a page are each 1½ inches wide and the side margins are each 1 inch wide. If the area of the printed material per page is fixed at 30 sq. in., what are the dimensions of the page of least area?

A. $(2 + 2\sqrt{5})''$ by $(3 + 3\sqrt{5})''$
B. $(3 + 2\sqrt{5})''$ by $(2 + 2\sqrt{5})''$
C. $(3 + 2\sqrt{5})''$ by $(2 + 3\sqrt{5})''$
D. None of these.

42. The area of the region bounded by the parabola $2y = 3x^2 + 1$, the x-axis, and the lines with equations $x = -1$ and $x = 3$ is

A. 14
B. 16
C. 15
D. 14½

43. The equation of a certain curve is $y = x^3 + 5x^2 + 3x$. If the slope of the tangent to the curve at (a, b) was found to be –4, one set of values of a and b would be

A. $\left(-\frac{7}{3}, 14\right)$
B. $(3, -1)$
C. $(-1, 6)$
D. $(-1, 1)$

44. The equation of a tangent to the graph of $y = \frac{x^2}{2} - x - \frac{1}{3}$ that is perpendicular to the graph of $y + 3x = 8$ is

A. $4y - 12x = 9$
B. $2y + 3x = 14$
C. $9y - 3x = -11$
D. $y + 4x = 7$

45. The equation of a tangent to the graph of $xy = 42$ at the point $(-6, -7)$ is

A. $6y + 7x = 42$
B. $6y + 7x = -84$
C. $6y - 7x = 42$
D. $6y - 7x = 84$

FOR COMPUTATIONS AND ROUGH WORK

(No marks will be assigned for work in this booklet.)

46. The area of the region bounded by the graphs of $y = x^2$ and $y = 4$ is

A. $\frac{32}{3}$

B. $\frac{16}{3}$

C. $\frac{64}{3}$

D. 2

47. The acceleration of a body under gravity is 32 ft./sec.^{2} downwards considering the distance measured upward as positive. The velocity v ft./sec. of a body at any time t sec. if it is thrown upwards at $t = 0$ with velocity of 180 ft./sec. is given by

A. $v = 180 - 32t$
B. $v = 180 + 32t$
C. $v = 32t - 180$
D. $v = -32t - 180$

48. A man 6 ft. tall is walking directly away from a post on which there is a lamp 18 ft. above the street level. If the man is walking at the rate of 5 ft./sec., how fast is the length of his shadow increasing?

A. $\frac{1}{2}$ ft./sec.

B. $\frac{5}{3}$ ft./sec.

C. 10 ft./sec.

D. $\frac{5}{2}$ ft./sec.

49. The slope of a curve at (x, y) is given by $Ax(x^2 -1)$, where A is some constant. The curve crosses the x-axis at $x = 3$ and it crosses the y-axis at $y = 2$. The equation of the curve is

A. $y = \frac{1}{4}x^4 - \frac{1}{2}x^2 + 2$

B. $63y = 2x^4 - 4x^2 - 126$

C. $y = -2x^4 + 4x^2 + 63$

D. $63y = -2x^4 + 4x^2 + 126$

FOR COMPUTATIONS AND ROUGH WORK

(No marks will be assigned for work in this booklet.)

SECTION C — pages 24 to 32

Your are to attempt ITEMS 50 through 75 only if you have been using the textbook, VECTORS AND MATRICES.

DO NOT ATTEMPT any questions in this section if the previous SECTION B has already been attempted.

VECTORS AND MATRICES — SECTION C

50. The value of $\mathbf{u} \cdot \mathbf{v}$ for $\mathbf{u} = (3, -\frac{1}{5}, -4)$ and $\mathbf{v} = \left(\frac{1}{3}, 5, -4\right)$ is

A. 18

B. $\frac{2}{15}$

C. $\frac{248}{15}$

D. 16

51. Resolve the vector $\mathbf{b} = (-7, 4, 5)$ into mutually orthogonal components.

A. −7, 4, 5

B. $-7\mathbf{e}_1$, $4\mathbf{e}_2$, $5\mathbf{e}_3$

C. $\sqrt{41}$, $\sqrt{65}$, $\sqrt{74}$

D. $\sqrt{65}$, $\sqrt{41}$, $\sqrt{71}$

52. The matrix $\begin{bmatrix} 5 & 2 \\ 6 & 2 \\ -1 & 4 \end{bmatrix}$ is a

A. 3 × 2 matrix
B. 2 × 3 matrix
C. reduced echelon form
D. none of these

53. The natural basis for V_2 is the pair of vectors

A. (1, 1), (0, 0)
B. (1, 0), (0, 1)
C. (1, 1), (0, 1)
D. (1, 2), (0, 1)

54. The sum of 3(5, −1) and 4(6, 0, 2) is

A. (39, −3, 8)
B. 12(11, −1, 2)
C. (15, −3)
D. none of these

55. $5\mathbf{e}_1 + 2\mathbf{e}_2 - 3\mathbf{e}_3$ expressed as an ordered triplet is

A. (5, 2, 3)
B. (5, 2, −3)
C. (10, 10, 10)
D. (4, 4, 4)

56. Given three vectors **u**, **v**, and **w** which are mutually perpendicular with $|\mathbf{u}| = 2$, $|\mathbf{v}| = 3$, $|\mathbf{w}| = 4$, find the magnitude of $3\mathbf{u} + 2\mathbf{v} + \mathbf{w}$

A. $\sqrt{14}$

B. $\sqrt{29}$

C. $\sqrt{76}$

D. $\sqrt{88}$

FOR COMPUTATIONS AND ROUGH WORK

(No marks will be assigned for work in this booklet.)

57. A unit vector collinear to the vector (3, 4, –2) is

A. (1, 1, –1)

B. $\left(\frac{3}{\sqrt{21}}, \frac{4}{\sqrt{21}}, \frac{-2}{\sqrt{21}}\right)$

C. $\left(\frac{3}{\sqrt{29}}, \frac{4}{\sqrt{29}}, \frac{-2}{\sqrt{29}}\right)$

D. e_3

58. The projection of vector $\mathbf{u} = (5, 6)$ on $\mathbf{v} = (7, 5)$ is

A. $\frac{65}{\sqrt{74}}$

B. (12, 11)

C. $k(5, 6)$

D. 65

59. The value of $\mathbf{e}_3 \cdot \mathbf{e}_2$ is

A. 0
B. (0, 1, 1)
C. 2
D. 1

60. If two vectors **u** and **v**, ($|\mathbf{u}| = 5$, $|\mathbf{v}| = 12$) form an angle of 60° at a common initial point, then $|\mathbf{u} + \mathbf{v}|$ has a value of

A. $\sqrt{109}$

B. $\sqrt{199}$

C. $\sqrt{139}$

D. $\sqrt{229}$

61. A 1500 lb. load is on a 20 ft. plank which leads from a 6 ft. high platform down to the ground. What force parallel to the plank is required to prevent the load from sliding? (Ignore the effect of friction.)

A. 450 lbs
B. 250 lbs
C. 1435 lbs
D. 65 lbs

62. If the augmented matrix of a system is $\left[\begin{array}{cc|c} 4 & -2 & 5 \\ 0 & 7 & -14 \end{array}\right]$, then the solution of the system is

A. $\left[\left(\frac{7}{2}, 2\right)\right]$

B. $\left[\left(\frac{1}{4}, -2\right)\right]$

C. $\left[\left(\frac{9}{4}, -\frac{1}{2}\right)\right]$

D. System is inconsistent

FOR COMPUTATIONS AND ROUGH WORK

(No marks will be assigned for work in this booklet.)

[OVER]

63. The augmented matrix for the system $\begin{cases} x + y + 2z = -2 \\ 3x - y + 3z = 5 \\ 4x - 2y + 5z = -1 \end{cases}$ is

A. $\begin{bmatrix} 1 & 1 & 2 \\ 3 & -1 & 3 \\ 4 & -2 & 5 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 5 \\ -2 & 5 & -1 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 1 & 2 & -2 \\ 3 & -1 & 3 & 5 \\ 4 & -2 & 5 & -1 \end{bmatrix}$

D. $\begin{bmatrix} 1 & 1 & 2 & 0 \\ 3 & -1 & 3 & 0 \\ 4 & -2 & 5 & 0 \end{bmatrix}$

64. Which of the following alternatives is the row-reduced echelon form of the augmented matrix of $\begin{cases} 3x - y = 4 \\ -6x + 2y = -8 \end{cases}$?

A. $\begin{bmatrix} 1 & -\frac{1}{3} & \frac{4}{3} \\ 0 & 0 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 1 & \frac{1}{3} & -\frac{4}{3} \\ 0 & 0 & 0 \end{bmatrix}$

C. $\begin{bmatrix} -1 & 1 & -4 \\ 0 & 1 & 4 \end{bmatrix}$

D. $\begin{bmatrix} 1 & -3 & 1 \\ 0 & 1 & -4 \end{bmatrix}$

65. For the transformation T determined by $\begin{cases} a = 4x + 5y \\ b = 3x - y \end{cases}$ the image of the point (–2, 3) is mapped as

A. (7, –9)
B. (–2, 3)
C. (23, 9)
D. (23, –3)

FOR COMPUTATIONS AND ROUGH WORK

(No marks will be assigned for work in this booklet.)

66. Find $4(2A - 3B)$ if $A = \begin{bmatrix} 3 & 6 \\ -4 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 7 & -1 \\ -3 & 8 \end{bmatrix}$

A. $\begin{bmatrix} 60 & -60 \\ -4 & 56 \end{bmatrix}$

B. $\begin{bmatrix} -15 & 15 \\ 1 & -14 \end{bmatrix}$

C. $\begin{bmatrix} -21 & 3 \\ 9 & -24 \end{bmatrix}$

D. $\begin{bmatrix} -60 & 60 \\ 4 & -56 \end{bmatrix}$

67. What set of vectors would determine a family of vectors each of which is parallel to (4, 6, 8)?

A. [2(4, 6, 8)]
B. [(2, 3, 4)]
C. $[(2k, 3k, 4k) \mid k \in R]$
D. $[k(4, 6) \mid k \in R]$

68. Under what condition are the vectors (2, 3) and (–4, –7) collinear?

A. $k(2, 3)$ when $k = -2$
B. $k(2, 3)$ when $k = 2$
C. $k(-4, -7)$ when $k = -\frac{5}{11}$
D. under no condition

69. The vectors (4, 0, 6), (0, 7, 0) and (4, 0, 0) are

A. collinear
B. coplanar
C. unit vectors
D. a basis for V_3

70. If the vector (9, –10, –3) is coplanar with $k(-1, 2, 1)$ and $l(3, -2, 0)$ then the values of "k" and "l" are

A. $k = 3, l = -2$
B. $k = -3, l = 2$
C. $k = 2, l = -3$
D. $k = -2, l = 3$

71. If the transformation S is given by $S \begin{cases} u = 2x - y \\ v = -4x + 2y \end{cases}$, then the set of points whose image under S is the point (–2, 4) can be written as

A. $\left[\left(\frac{3k - 1}{2}, k\right) \mid k \in R\right]$

B. $[(2 + 3k, k) \mid k \in R]$

C. $\left[\left(\frac{2 + 3k}{2}, k\right) \mid k \in R\right]$

D. $\left[\left(\frac{k - 2}{2}, k\right) \mid k \in R\right]$

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COMPUTATIONS AND ROUGH WORK

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Departmental examinations,
[grade 12] 1969. -

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[OVER]

72. The system $\left\{ \begin{array}{rcr} 2x + 4y &=& 8 \\ 6x - 2y &=& 14 \\ 4x - 6y &=& 6 \\ 10x + 6y &=& 30 \end{array} \right.$ may be considered as

A. inconsistent
B. independent
C. dependent
D. none of these

73. Two forces of 50 lbs and 60 lbs act on an object at an angle of 60° to each other. The sine of the angle the resultant makes with respect to the 60 lb force is

A. $\dfrac{25\sqrt{3}}{\sqrt{9100}}$

B. $\dfrac{25\sqrt{3}}{\sqrt{3100}}$

C. $\dfrac{\sqrt{9100}}{25\sqrt{3}}$

D. $\dfrac{\sqrt{3100}}{25\sqrt{3}}$

74. What is the cosine of the angle the line segment from $B(1, -4, -2)$ to $C(3, 6, 2)$ makes with the positive direction of the z-axis?

A. $\dfrac{\sqrt{30}}{30}$

B. $\dfrac{\sqrt{30}}{60}$

C. $\dfrac{-\sqrt{30}}{15}$

D. $\dfrac{\sqrt{30}}{15}$

75. A vector F lbs starting from the origin and terminating at a point having coordinates (4, 3, 2) represents a 50 lb force. The x, y and z components in lbs are

A. $F_x = \dfrac{200}{\sqrt{29}}, \quad F_y = \dfrac{150}{\sqrt{29}}, \quad F_z = \dfrac{100}{\sqrt{29}}$

B. $F_x = \dfrac{100}{\sqrt{29}}, \quad F_y = \dfrac{150}{\sqrt{29}}, \quad F_z = \dfrac{200}{\sqrt{29}}$

C. $F_x = \dfrac{200}{29}, \quad F_y = \dfrac{150}{29}, \quad F_z = \dfrac{100}{29}$

D. $F_x = \dfrac{100}{29}, \quad F_y = \dfrac{150}{29}, \quad F_z = \dfrac{200}{29}$